Draft Vapor Intrusion Mitigation Work Plan

For

Valley Asphalt Property / South Dayton Dump & Landfill
Moraine, Ohio

Submitted to:
U.S. EPA, Region 5
Emergency Response Branch
Cincinnati, Ohio
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1.0 INTRODUCTION

Bowser-Morner Inc. prepared this Vapor Intrusion (VI) Mitigation Work Plan on behalf of Valley Asphalt, Respondent to the Removal Unilateral Administrative Order (UAO) issued by U.S. EPA on March 22, 2013. This Work Plan details mitigation measures to address concentrations of volatile organic compounds (VOCs) and explosive gases detected in sub-slab soil vapor and indoor air in buildings owned by Valley Asphalt (Valley). The approved Work Plan is a fully enforceable part of the Order.

Valley's property (Site) is an approximate 10-acre parcel that is located on a portion of the South Dayton Dump and Landfill site (SDDL site) in Moraine, Ohio. The SSDL is a former industrial waste landfill that consists of approximately 80 acres, which accepted household wastes, drums, metal turnings, fly ash, foundry sand, demolition debris, wooden pallets, asphalt, paint, paint thinner, oils, break fluid, asbestos, solvents, transformers, and other industrial wastes. A group of potentially Responsible Parties (PRPs) is working a project parallel to Valley's in accordance with the Administrative Settlement Agreement and Order on Consent for Removal Action (ASAOC) with USEPA, for the SDDL site. The PRP group and their consultant, known as "others" in this report, have provided much of the information found in this Work Plan.

This Work Plan was prepared in accordance with the following documents:

- United States Environmental Protection Agency (UISEPA) Vapor Intrusion Investigation Work Plan (USEPA, November 2011),
- USEPA Region 5 Vapor Intrusion Guidebook (USEPA, 2010)(USEPA Region 5 Guidance);
- Ohio Environmental Protection Agency (OEPA(Sample Collection and Evaluation of Vapor Intrusion to Indoor Air Guidance Document, (OEPA, May 2010); and
- OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)(USEPA, November 2002).

Bowser-Morner has also prepared this Work Plan to comply with the substantive requirements of Ohio Administrative Code (OAC) 3745-27-12 with respect to permanent monitoring for explosive gas in buildings location within the limits of waste. This mitigation work will be completed in accordance with Section 104(1)(1) of the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA), 42 U.S.C §960 (a)(1), and 40 CFR §300.415 (Removal Action) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to abate or eliminate the immediate threats posed to public health and/or the environment.

Installation of the mitigation systems for VOCs and explosive gases will require approximately 100 calendar days after approval of this Work Plan by USEPA to complete, followed by regularly-scheduled performance testing activities. A Project Schedule, which details milestones and task duration, is presented in Section 7.

1.1 OBJECTIVES OF THE VI MITIGATION ACTIVITY

This VI Mitigation Plan is intended to directly address actual or potential releases of hazardous substances on the Site, which may pose an imminent and substantial endangerment to public health, or welfare, or the environment. The VI Mitigation activity's primary objective is to design and install a vapor abatement mitigation system in on-Site commercial structures impacted by subsurface gas migration, if the concentration(s) of contaminant(s) of concern (COCs) are greater than Ohio Department of Health (ODH)[1] sub-slab or indoor air screening levels and the presence of the COC is determined to be a result of vapor intrusion.

To achieve this objective, the following removal activities will be completed at a minimum:

- Develop and implement a Site Health and Safety Plan.
- Conduct gas sampling (including VOCs and methane) using sub-slab and indoor air sampling techniques.

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1 ODH Health Assessment Section provided screening levels for sub-slab and indoor air contaminants of concern in a letter dated July 6, 2012. ODH screening levels for naphthalene were provided by electronic mail (email) on September 13, 2012. Revised ODH screening levels to correct the indoor air non-residential values for o-xylene were issued on October 9, 2012.

- Installation of a sub-slab depressurization system (SSDS), sealing cracks in walls and floors of the basement, and sealing drains that could be a pathway for vapor intrusion. The vapor mitigation systems will be designed to control levels of methane and VOCs to below ODH sub-slab and indoor air screening levels.

- Develop and implement a proficiency sample plan to confirm that ODH screening levels are achieved for COCs following installation of on-site vapor mitigation systems. If ODH screening levels are not achieved within 30-days of installation, Valley will submit a Corrective Action Plan to USEPA within 30 days of discovery.

- Develop and implement an operations, maintenance and monitoring (OM&M) plan at buildings where SSDSs are installed, including a long term inspection and monitoring plan.

1.2 SITE DESCRIPTION

The SDDL site encompasses 1901 through 2153 Dryden Road and 2225 East River Road in Moraine, Ohio. Valley Asphalt purchased a portion of the site on May 7, 1993. For purposes of this report, the property owned by Valley will be referred to as the "Site". The Site has mailing addresses of 1901 and 1903 Dryden Road in Moraine, Ohio and is depicted in Figure 1.1. The Site is an irregularly-shaped property located in the northern portion of the SDDL site. The Site is bounded to the north and west by the Miami Conservancy District (MCD) floodway, the Great Miami River Recreational Trail and the Great Miami River (GMR) beyond. The Site is bounded to the east by Dryden Road and the SDDL site with light industrial facilities and residential properties beyond. The Site is bounded entirely to the south by the SDDL site.

The Site is currently occupied by Valley's Dryden Road asphalt plant facility. Until a few years ago, Murphy's Plumbing, a "squatter" who appears to have sold and stored ceramic bathroom fixtures and other plumbing supplies on-site, occupied a small portion of the northeast corner of the Site. In addition, a single-story block garage appears to straddle the Valley property line immediately adjacent and south of the entrance drive onto the site. According to Mark Fornes Realty, Jack Boesch owns this building, indentified as Building 7 in this (and previous) report(s).

Valley's project encompasses the buildings shown in Table 1

VALLEY ASPHALT BUILDINGS ADDRESSED IN MITIGATION PLAN

Building Number	Address	Use/Description
1	1901 Dryden Road	Former office building; 1500 square feet; slab-on-grade
2	1903 Dryden Road	Bricked-front area of the building previously was used as office space/rear area of building is used for storage; 4,888 square feet; slab-on-grade
4	1901 Dryden Road	Plant control building with basement; 280 square feet
5	1901 Dryden Road	Quality control building; 280 square feet; slab-on-grade
6	1901 Dryden Road	Pre-fab metal storage shed; 218 square feet; earthen floor
7	Dryden Road	Storage building owned by others; 822 square feet; appears to be slab-on-grade
MP	Dryden Road	Former plumbing supply; 365 square feet; undetermined construction

Commercial and industrial properties bound the SSDL site to the east and south including an approximate 30-acre maintenance facility owned by Dayton Power and Light (DP&L). Additional commercial and industrial properties are located on the opposite bank of the GMR to the northeast, north, northwest west and southwest. The Montgomery County Sewage Disposal facility is located on the opposite bank of the GMR, southwest from the Site.

Approximately 25,060 people live within a 4-mile radius of the Site. Residential properties exist more than 1,500 feet (ft) north of the Site beyond the opposite bank of the GMR. Other residential properties are located at least 11,000-feet south and southeast of the Site, along Dryden and East River Roads.

A landfill operated on the approximate 80-acre SDDL site from the 1940s until 1996. Municipal, commercial, industrial and residual wastes and construction and demolition (C&D) debris were disposed of at the landfill over the years. Combustible wastes were often burned.

First leased, then purchased, an asphalt plant has been operated by Valley on the Site since the mid-1950s. During that time, Valley has stored raw materials, batched asphalt, and conducted quality-related testing on-site and sold driveway sealer to the public. Valley did not place waste or C&D debris in or on the landfill.

COCs indentified in the fill, waste, and soil at the SDDL site consist of the following: VOCs including but not limited to trichlorethene (TCE), cis-1,2-dichloroethene (cis, 1-2,DCE), vinyl chloride (VC) and benzene; semi-volatile organic compounds (SVOCs) including, but not limited to, polynuclear aromatic hydrocarbons (PAHs) and naphthalene; polychlorinated biphenyls (PCBs); and metals including lead, copper, arsenic and other inorganic chemicals. Contaminants, including VOCs, arsenic, lead and some other chemicals detected in the landfill, have been detected in groundwater samples collected from a number of monitoring wells at and near the SDDL site. Napthalene and VOCs, including benzene, chlorobenzene, cis-1,2-DCE, isopropyl benzene, ethylbenzene, TCE and VC were also detected in sampled collected from soil gas probes throughout the SDDL site.

1.2.1 GEOLOGY, HYDROGEOLOGY, TOPOGRAPHY

The Dayton area is located within the buried pre-glacial valley system that underlies the present day GMR and its tributaries in southwestern Ohio. This pre-glacial valley system is knows as the Miami Valley Aquifer System. The regional overburden geology of the Dayton area consists of glacial tills and glaciofluvial sand and gravel deposits. Norris and Spieker (1966) defined the overburden units, based on general character and relative position as follows (from top to bottom):

- Ground Moraine (glacial till) – composed of silt, gravel and clay; found primarily in the uplands areas (not present at the Site);

- Upper Aquifer Zone – the saturated glaciofluvial sand and gravel zone located above a major till-rich zone;

- Till-Rich Zone – composed of discontinuous fine-grained glacial till and other fine-grained materials with substantial components of sand and gravel;

- Lower Aquifer Zone – the glaciofluvial sand and gravel zone located beneath the Till-Rich Zone.

The subsurface geology in the vicinity of the SDDL site consists of fill and waste underlain by glacial tills, and glaciofluvial sand and gravel deposits.

Norris and Spieker (1966) identified three principal hydrogeologic units in the Dayton area, as follows:

- Upper Aquifer Zone – the upper portion of the saturated glaciofluvial sand and gravel facies;

- Till-Rich Zone – a zone of discontinuous, low permeability till facies interspersed with sand and gravel facies which act as an aquitard in some areas;

- Lower Aquifer Zone – the lower portion of the saturated glaciofluvial sand and gravel facies.

The subsurface hydrostratigraphy in the vicinity of the SDDL site is consistent with the regional geology of the Miami Valley Aquifer System with the exception that the Till-Rich Zone is highly discontinuous beneath the SDDL site. Monitoring wells installed on the SDDL site are screened in sand and gravel deposits above approximately 675-ft above mean sea level (AMSL). These deposits appear to be representative of the Upper Aquifer Zone. Monitoring wells screened below 675 ft AMSL appear to be representative of the Lower Aquifer Zone. Due to the stratigraphic variation of the Till Rich Zone both vertically and laterally, the implied 675 ft AMSL boundary between the Upper and Lower Aquifer Zones is approximate and may vary in elevation across the Site.

Groundwater flow in the Upper Aquifer Zone is influenced by the presence of the GMR to the north and west of the Site. Shallow groundwater (i.e., Upper Aquifer Zone) typically flows radially towards the GMR. However, during extended periods of high flow in the GMR, groundwater flow slightly to the southeast has been documented. Basically, the stage of the GMR determines whether it is a gaining (effluent) or losing (influent) stream. For example, during flood events, groundwater flow is occasionally reversed and migrates from the GMR to the Site and the SSDL site.

Groundwater flow in the Lower Aquifer Zone is predominantly to the southwest in the area, with occasional slight southeasterly components, and is not significantly affected by the GMR. However, in areas where the intermediate till rich zone is absent, the upper and lower aquifer are in direct communication and the stage of the GMR will affect the flow in the lower aquifer zone. The groundwater level elevation in the vicinity of the Site is reported to between 700 and 725 AMSL at the Site.

A heavily vegetated man-made embankment is present along the northern and western boundary of the Site, along the GMR. The grassy area between the berm and the GMR is part of the 100-year floodway and is owned by the MCD. The topography of the Site is fairly level, due to grading activities. The largest stockpile, a recycled asphalt product (RAP) pile, rises approximately 40-feet above the ground surface. A paved roadway provides access from Dryden Road and along the northern portion of the Site. A majority of the Site's land surface is covered with stockpiles of raw materials.

The topography of the SDDL site is variable with embankments along the Great Miami Recreational Trail, an unpaved access road, a depressed area, several mounded areas of fill, a ravine and a low-lying area along the entire southern portion of the SDDL site.

1.3 SITE HISTORY

From 1941 until 1993 various members of the Boesch and Grillot families owned the Site (and to the present, own a majority of the SSDL site) where waste disposal activities were conducted. The majority of the properties that comprise the SDDL site were acquired over time by Horace Boesch and Cyril Grillot.

The landfill operated from the early 1940s to 1996 and is partially filled sand and gravel pit. The landfill contains household waste, drums, metal turnings, fly ash, foundry sand, demolition material, wooden pallets, asphalt, paint, paint thinner, oils, brake fluids, asbestos, solvents, transformers and other industrial materials known to have been brought to the SDDL site. As the excavated areas of the SDDL site were filled, some of the property was sold and/or leased to businesses along Dryden and East River Roads. Valley purchase Parcel 5054, consisting of approximately 10– acres, in 1993. The Miami Conservancy District owns the southern part of the SDDL site.

Disposal of waste materials began at the SDDL site in the early 1940s. Materials dumped at the SDDL site included drummed wastes. Known hazardous substances were brought to the SDDL site, including drums containing hazardous waste from nearby facilities. Some of the drums contained cleaning solvents (1,1,1-triochloroethane [TCA], methyl ethyl ketone [MEK], and xylenes); cutting oils; paint; Stoddard solvents; and machine-tool, water based coolants. The SDDL site previously accepted materials including oils, paint residue, brake fluids, chemicals for cleaning metals, solvents, etc. Large quantities of foundry sand and fly ash were dumped at the SDDL site. Asbestos was also reportedly dumped at the site.

USEPA conducted a screening site inspection of the SDDL site in 1991. OEPA conducted a site team evaluation prioritization of the landfill in 1996. In 2002, USEP conducted an aerial photographic analysis of the SDDL site.

In 1991, four underground storage tanks (USTs) were removed from the Site. Two 4,000-galon steel USTs contained waste oil and gasoline, respectively. Two 3,000-gallon USTs contained diesel and kerosene, respectively.

In 2000, Valley Asphalt removed five drums containing characteristic hazardous waste, PCBs, VOCs and 2,217 tons of contaminated soils from the northern area of the Site that were uncovered during the excavation for a sewer line.

USEPA proposed the SDDL site to the National Priorities List (NPL) in 2004. In 2008 to 2010, others completed several investigations at the SDDL site, including geophysical surveys, test pit and test trench sampling, vertical aquifer sampling, landfill gas sampling and groundwater monitoring well installation and sampling. From these investigations, the USEPA determined that the groundwater beneath portions of the SDDL site contains vinyl chloride, TCE, 1,2-DCE, arsenic, lead and other chemicals. Based on the investigations, the remedial work to be completed on the SDDL site was divided into two parts. The remedial strategy for Operable Unit One (OU1), which is shown on Figure 1.2 and outlined in red, is expected to involve evaluating cleanup alternatives to address 55-acres of the landfill. Valley's Site lies within OU1 and the cleanup alternatives that are being considered will allow Valley to remain operating safely. In 2012, USEPA, in consultation with OEPA, determined that additional data must be collected on groundwater and potential hot spots before selecting a remedy for OU1. Additional investigation and remedy evaluation is ongoing.

1.3.1 SITE HISTORY –VAPOR INTRUSION SAMPLING

Exterior Sampling Activities

In 2009 and 2010, others collected soil vapor samples from three permanently-installed soil vapor probes located on the Valley Site. Each soil vapor probe was located in exterior areas (as opposed to interiors of buildings). The samples were submitted to an accredited laboratory and analyzed for VOCs by USEPA Method TO-15. Others compared the soil vapor sample results to generic soil vapor screening levels that were derived by applying the USEPA Region 5 Guidance (USEPA, 2010) default soil gas-to-indoor air attenuation factor of 0.1 to the USEPA indoor air regional screening levels (RSLs). The VOCs detected in soil vapor samples at concentrations greater than the generic soil vapor screening levels were 1,1-dichloroethane (DCA); 1,1-dichloroethene, benzene; chlorobenzene; ethylbenzene; tetrachloroethene (PCE): vinyl chloride, trichloroethene, and total xylenes. Exceedances of the generic soil vapor screening levels occurred at all three of the permanently-installed Valley Site soil vapor probes.

Others completed field screening for methane at the exterior soil vapor probes in 2009. The soil vapor methane concentrations were compared to the upper explosive limit

(UEL)(15 percent methane) and Lower Explosive limit (LEL)(5 percent methane) for methane. Methane concentrations were greater than 10 percent of the LEL (0.5 percent methane) at one of soil vapor probe locations on the Valley Site (Building 2).

<u>Interior Sampling Activities</u>

Indoor air and sub-slab sampling locations are summarized below.

<u>Building 1</u>

On August 6, 2012, the chemical trichloroethene (TCE) was observed in a sub-slab sample collected in Building 1 at a concentration of 2,700 ppbv. This result exceeds the ODH TCE sub-slab screening level of 20 ppbv. The chemical TCE was also observed in an indoor air sample at a concentration of 8.1 ppbv. This result exceeds the ODH TCE indoor air screening level of 2 ppbv. These results confirm that vapor intrusion is occurring in Building 1. The U.S. EPA and ODH have concluded that there is a potential public health threat posed by TCE vapor intrusion.

<u>Building 2</u>

On March 13, 2012, 6.6% methane was observed in a sub-slab sample collected from Building 2. This result exceeds the ODH methane screening level of 0.5%. While methane was not detected in the indoor air of Building 2, the U.S. EPA and ODH have concluded that there is a potential explosion hazard beneath this building because methane is explosive between 5 and 15%.

Building 2 is currently closed to access. In January 2012, appropriate notifications of the exceedance of the methane LEL were provided to USEPA, OEPA, representatives of the Public Health - Dayton and Montgomery County (PHDMC), the City of Moraine Fire Division[2], and the Moraine Police Division. Others manually measure the indoor air and sub-slab methane concentrations at this building on a weekly basis to ensure that methane concentrations do not increase and that methane is not migrating from beneath the slab into the building. On January 24, 2013, one Sierra Gas monitor (model 2001) was installed in Building No. 2. At the present, others have proposed to install a battery back-up unit for the gas monitor. Once the battery back-up unit has been installed, weekly manual methane readings by others will be discontinued. Valley will conduct weekly checks of the gas monitor to ensure that it is operational and that methane levels are within acceptable ranges. The results of these checks will be documented on the Methane Monitoring log, included in Appendix B.

<u>Building 4</u>

In 2012, the chemical TCE was observed in 4 different sub-slab samples collected in Building 4. TCE concentrations ranged from 46 to 200 ppbv, which all four exceed the ODH TCE sub-slab screening level of 20 ppbv. The chemical TCE was not observed in the indoor air samples collected in Building 4 at concentrations greater than the ODH TCE indoor air screening level of 2 ppbv. These results show that at the time of each sampling event in 2012, vapor intrusion has not been documented in Building 4, but that there is the potential for vapor intrusion to occur in the future.

Although the compound acetaldehyde was detected in two indoor air samples at concentrations greater than the acetaldehyde ODH indoor air screening level, this compound was not detected in the co-located sub-slab soil vapor samples, indicating that the indoor air concentrations are not due to vapor intrusion.

<u>Building 5</u>

In 2012, the chemical TCE was observed in 3 different sub-slab samples collected in Building 5. TCE concentrations ranged from 240 to 700 ppbv, which all three exceed the ODH TCE sub-slab screening level of 20 ppbv. The chemical TCE was not observed in the indoor air samples collected in Building 5 at concentrations greater than the ODH TCE indoor air screening level of 2 ppbv. These results show that at the time of each sampling event in 2012, vapor intrusion has not been documented in Building 5, but that there is the potential for vapor intrusion to occur in the future.

Building 6

In January and April 2012, CRA conducted field screening for methane in building 6. At each sampling event, CRA did not observe any methane detections beneath the subslab. Based on the field screening results collected from Building 6, the U.S. EPA and ODH conclude that no additional sampling is required, at this time.

Building MP

On August 6, 2012, the chemical tetrachloroethene (PCE) was observed in an indoor air sample collected from the crawl space in Building MP at a concentration of 38 ppbv. This result exceeds the ODH PCE indoor air screening level of 25 ppbv. This result confirms that vapor intrusion is occurring in Building MP. Based on the PCE laboratory results of the indoor air (crawl space) sample collected from Building MP, the U.S. EPA and ODH conclude that there is a potential public health threat posed by PCE vapor intrusion. U.S. EPA will be contacting you in the near future to discuss mitigation options for your property as part of the SDDL Site removal action.

The maximum sub-slab and indoor air concentrations (ppbv unless otherwise stated) that were greater than the ODH screening levels (ppbv unless otherwise stated) for each building sampled in 2012 are presented in Table 1.2.

TABLE 1.2

HISTORIC SUB-SLAB AND INDOOR AIR SAMPLING RESULTS

Building Number	**COC**	**Max Sub-Slab Concentration (ODH Screening Limit)**	**Max Indoor Air Concentration (ODH Screening Limit)**
1	TCE	2,700 (20)	8.1 (2.0)
2	TCE Methane	32 (20) 6.6% (0.5%)	No exceedances
4	TCE	200 (20)	No exceedances
5	TCE	700 (20)	No exceedances
6	No monitoring known to have performed to date	No monitoring known to have performed to date	No monitoring known to have performed to date
7	No monitoring performed to date	No monitoring performed to date	No monitoring performed to date
MP	PCE	No monitoring performed to date	38 (25)

2.0 SITE MOBILIZATION

2.1 HEALTH AND SAFETY PLAN

A Health and Safety Plan (HASP) has been established for this Site and is included in Appendix C. The HASP is a "living document" and procedures will be updated if additional information is discovered which requires alteration of the plan.

Site control measures are addressed as Section 5.11 of the HASP.

Sanitary facilities (i.e., Porta-Potty) are available near Building 4. A map to the hospital is posted on the inside of the primary man-door leading into Building 4. First aid kits are available in Building 4 and in Building 5. Nearby Weston offices (711 East Monument Avenue, Dayton, Ohio) will be available for meetings and emergency response.

2.2 PRE-WORK MEETING

A pre-work meeting will be held between Valley, USEPA On-Scene Coordinator (OSC), ODH Licensed Radon contractor, and the other contractors to discuss this work plan, once approved by USEPA. All participants will read and formally acknowledge the provisions of the HASP before initiating on-Site work. The following topics may be discussed in detail: provisions for Site security, mobilization, emergency procedures, delegation of responsibilities, and channels communication.

2.3 EMERGENCY PROCEDURES

Emergency procedures have been established for this Site. Emergency procedures provide specific guidelines and establish procedures for the protection of personnel in the event of an emergency. The emergency procedures included as Section 5.8 – 5.10 of the HASP.

3.0 SAMPLING ACTIVITIES

A Quality Assurance Project Plan (QAPP) has been established for this Site, to ensure data collected during sample activities are reliable. A copy of the QAPP is included in Appendix D.

Field sampling activities required by the UAO will be completed in accordance with the sampling procedures, sampling plan, and associated analysis detailed below and in accordance with USEPA-issued guidance documents.

Gas sampling activities may include one or more of the following: sub-slab soil vapor, ambient air, and/or indoor air samples. Gas samples will be collected, analyzed, and evaluated in accordance with the following procedures. Gas samples will be analyzed for the parameters included in the TO-15 list of analytes. All existing sub-slab soil vapor and indoor air sample locations for all on-Site buildings that require mitigation are presented on Figures 3.1 to 3.7.

3.1 SAMPLE COLLECTION

A sub-slab probe will be installed in Building 6. This probe will be installed and sampled in accordance with the USEPA Response Engineering and Analytical Contract (REAC) SOP#2082 (Appendix J). The results of that investigation will determine whether mitigation of Building 6 is indicated.

Mitigation has been ordered for Buildings 1, 2, 4, 5, 7 and MP via the UAO. Valley has chosen to totally demolish Buildings 1, 7 and MP and to demolish the front (office) portion of Building 2. Therefore, mitigation, including sample collection, will be performed on Buildings 4 and 5 and the back (storage) portion of Building 2.

All SUMMA canisters used for sample collection will be batch certified (industrial and commercial buildings) by the analytical laboratory to ensure they are free of contamination before collecting the samples.

During sample collection, Valley will check each SUMMA canister periodically to ensure that the canister pressure has not reached zero; at a minimum, the canisters will be checked several hours before the end of the sampling period. In accordance with the sub-slab soil vapor sampling protocol (FSP), some residual vacuum should be left in each canister following sample collection. A minimum 1" Hg residual vacuum will be required for the sample to be considered valid, or the sampling will be repeated using a fresh SUMMA canister. In some instances, the canister pressure may decrease to below 5” Hg in less than the target amount of time. A SUMMA canister may be closed and sampling ended once the vacuum decreases below 5” Hg provided that at least 75 percent of the targeted sample time (i.e., 45 minutes for a 1-hour sample, 6 hours for an 8-hour sample, and 18 hours for a 24-hour sample) has elapsed. Provided the residual vacuum is a minimum of 1” Hg and the sample duration was at least 75 percent of the target duration, the sample will be considered a valid sample.

The target maximum residual vacuum is 5 inches of mercury (" Hg). If, after the required duration of sample collection (i.e., 1, 8, or 24 hours), the vacuum has not reached 5" Hg, the canister valve may be closed once the vacuum reaches a minimum of 10" Hg, as long as the specified duration of sample collection (i.e., 1, 8, or 24 hours) has elapsed. This will be considered a valid sample.

If the vacuum has not reached 10" Hg and access to the building is ending for the day, Valley will notify USEPA. If building access is provided for the following day, close the sample valve and record the canister vacuum and date. Return the following day, record the canister vacuum and date and complete sample collection. If building is not available for the following day, check with the laboratory if detection limits can be met and end sampling. If the detection limits cannot be achieved, re-sampling will be required.

A summary of the acceptable sample canister end pressures and times is provided in the following table:

Duration of Sampling	*Sample Canister Vacuum*	*Required Procedure*
Less than 6 Hours	Less than or equal to 5" Hg	Invalid sample. Collect new sample with new canister.
More than 6 Hours	Less than or equal to 5" Hg	Acceptable sample. End sampling.
Less than 8 Hours	Less than 10" Hg	Continue sampling until vacuum reaches 5" Hg, or 8 hours have elapsed, whichever occurs first.
More than 8 Hours	Greater than 10" Hg	End sampling when vacuum reaches 10" Hg.
Building access issues necessitate an end to sampling	Greater than 10" Hg	Notify USEPA. Check if building access is available the next day. If building access is available the next day: Record canister end vacuum and date, close sample valve. Record day 2 canister start vacuum and date, continue sample. If building access is not available the next day: end sampling and check with laboratory if required detection limits can be met.

In accordance with the SOPs, canisters will be labeled noting the unique sample designation number, date, time, and sampler's initials. A bound field logbook will be maintained to record all sampling data. The unique sample designation numbers will have the following format:

MC -38443-MMDDYY-XX-Nn

Where:

MC (Matrix Code)	–	Designates sample type (SS - sub-slab soil vapor; IA - indoor air; OA - outdoor air; CS - crawl space)
161803	–	Project reference number
MMDDYYY	–	Designates date of collection presented as month, day, year
XX	–	Sampler's first and last initials
Nn	–	Building number followed by sample location

Details of the sampling will be recorded within a standard field book and on an

Air Sampling Field Data Sheet. Details should include:

- SUMMA canister, flow controller and pressure gauge IDs
- Sample start time and initial SUMMA canister pressure
- Outside temperatures and barometric pressures
- PID readings within the building
- Helium leak test concentration
- Sample end time and final SUMMA canister pressure
- Unique sample designation number

If requested, a sub-slab sample and/or indoor air sample will be collected where any new locations that may be identified as requiring sampling. Sub-slab samples will be collected from the soil vapor located beneath the concrete slab beneath the lowest level of the building.

Sampling will not be performed during storm events or within 48 hours of a significant rain event (i.e., greater than 1 inch of rain in a 24-hour period) because of the potential influence such conditions may have on indoor air, outdoor air, and sub-slab soil vapor. Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Moraine, Ohio, during the sampling event will be obtained from Weather Underground's website. In fine-grained soil conditions, consideration will be given to allowing a greater amount of time for rainfall events to dissipate. The vadose zone soil types at the site are mainly sand and gravel fill, with some silt and clayey silt. Valley field technicians, in consultation with USEPA oversight consultants, will determine if more than 48 hours should be allowed to elapse following a significant rain event for probes in areas of fine grained soils.

3.2 MITIGATION SYSTEM SAMPLING

3.2.1 PROFICIENCY AIR SAMPLING

To verify that the mitigation systems are operating to reduce indoor air concentrations of VI contaminants to less than applicable criteria, Valley will complete post-installation proficiency air sampling. The post-installation proficiency sampling will be comprised of three elements:

a. Collection and analysis of indoor air samples from each building mitigated;

b. Collection and analysis of outdoor samples adjacent to each building mitigated;

c. Collection and analysis of SSDS effluent samples from each building mitigated; and

d. Collection and analysis sub-slab samples from each building mitigated;

Valley will collect air samples from the locations listed in Table 3.2, following system installation. Should the proposed sub-slab gas survey for Building 6 indicate that mitigation is necessary, that system will be included in the proficiency air sampling program.

TABLE 3.2
BUILDINGS REQUIRING MITIGATION AND PROFICIENCY SAMPLING

Parcel / Map Building Number	*Address*	*Current Use*
5054/2	1903 Dryden Road	Storage
5054/4	1901 Dryden Road	Asphalt Plant control building
5054/5	1901 Dryden Road	QA Building

<u>3.2.1.1 Indoor Air Sampling</u>

Valley will collect indoor air samples from all buildings in which SSDSs have been installed 30-days, 180-days and 1 year after installation of the SSDS. Beginning in the second year after installation of the mitigation systems, Valley will complete annual indoor air proficiency sampling at a subset of 20 percent of operating systems, equivalent to 1 sample, at a location approved by USEPA prior to scheduling of the sampling for as long as the SSDSs remain operational. During the first year of the annual indoor air proficiency sampling program, Valley will collect the indoor air proficiency samples in the building with the greatest sub-slab soil vapor or indoor air concentrations. During subsequent years, Valley will propose locations and provide a rationale for sampling at the proposed locations for USEPA approval prior to collecting the samples. Proficiency air sampling will continue until USEPA notifies Valley that work is complete. Valley will provide the results and corresponding evaluation after each sampling event to USEPA within 30 days of receiving the complete set of final analytical data.

In the event that proficiency air sampling indicates the system has not reduced or maintained concentrations below the applicable indoor air screening levels, a Corrective Action Plan will be submitted to USEPA within 30 days. Corrective actions will include evaluation of the performance of the SSDS and completion any necessary system modifications. System modifications may include adding an additional extraction point(s), sealing cracks in the floors, and/or sealing or fixing drains or sub-slab sampling. All system modifications will be pre-approved by USEPA prior to implementation. Following completion of system modifications, Valley will complete a follow-up indoor air sampling event within 30 days of completion of system modifications.

The indoor air proficiency sampling events will be performed by at least two Bowser Morner field staff and are anticipated to take approximately 1 week for each of the 30-day, 180-day, and 1-year sampling events. Valley will provide USEPA with email notification regarding scheduling, a minimum of 2 weeks in advance of proficiency sampling events.

3.2.1.2 Outdoor Air Sampling

Outdoor air sampling will be performed concurrently with indoor air sampling. Where samples are collected from adjacent or nearby buildings, one outdoor air sample may be sufficient for comparison to the indoor air sample results from more than one building.

3.2.1.3 SSDS Effluent Sampling

Immediately following installation of the SSDSs, Valley will collect one air grab sample of the effluent from the SSDS at the location with the highest sub-slab soil vapor concentrations of TCE. The sample will be collected and analyzed in accordance with procedures detailed below.

3.2.1.4 Sub-Slab Sampling

Immediately following installation of the SSDSs, Valley will collect one air grab sample from the sub-slab port in each building with an SSDS. Sub-slab sampling will be performed concurrently with indoor air sampling. The samples will be collected and analyzed in accordance with procedures detailed in Sections 3.4 and 3.6 below.

3.2.2 DE MINIMIS EFFLUENT AIR SAMPLING

On May 13, 2013, Katherine Beach of Bowser Morner discussed *de minimis* emission and individual hazardous air pollutant (HAP) issues with Andy Roth of the Regional Air Pollution and Control Agency (RAPCA), by telephone and email.

Using conservative initial calculations provided by Andy Roth to Valeria Chan on January 14, 2013, a flow rate resulting in *de minimus* emissions was calculated. Based on the greatest sub-slab TCE concentration of 2,700 ppbv (measured in a sample collected from 1901 Dryden Road, Building 1), a total SSDS flow rate of 4,100 ft^3/min or less conforms to the Ohio EPA de minimis HAP emission rate of one ton per year. Accordingly, provided the total SSDS flow rate is equal to or less than 4,100 ft^3/min, and maximum sub-slab soil vapor TCE concentration does not exceed 2,700 ppbv, submittal of an air permit application or performance of effluent air sampling is not required by RAPCA. In accordance with USEPA's request to others to collect an annual sample of the effluent from the SSDS at the location with the highest sub-slab soil vapor concentrations of TCE, Valley will do the same.

Immediately following installation of the SSDSs, Valley will collect one air grab sample from the discharge sampling port(s) (i.e., each location where there is a fan/blower) of the building with the greatest sub-slab TCE concentration (i.e., Building 2) annually. The samples will be collected and analyzed in accordance with procedures detailed in Section 3.7 below. In addition, Valley will collect one de minimis air sample annually from the building with the greatest sub-slab TCE concentration (based on the most recent sample results available at the time), for the duration of system operation.

In addition to the collection of air samples, velocity readings will be measured at each exhaust pipe with a velocity meter. Flow rates will be calculated for each emission discharge point. The flow rate and analytical data will be used to calculate the approximately daily, monthly, and yearly emission amounts. As a conservative measure, the preliminary calculations will assume that all buildings discharge at the same rate as the worst-case building.

The effluent air sample results will be compared to State of Ohio de minimis levels, documented in Ohio Administrative Code 3745-15-05, to determine if other regulatory requirements apply.

3.3 INDOOR AIR SAMPLING

As noted in Section 3.2.1 above, indoor sampling will be performed in accordance with the SOP for indoor and outdoor air sampling. All buildings to be mitigated have an area less than 1,500 square feet; only one indoor air sample will be collected.

In June 2011, December 2011 and July 2012, representatives of CH2M Hill, Ohio EPA, Valley and CRA completed building surveys at the parcels associated with the SDDL. The building surveys were completed in order to gather the information necessary to develop VI-specific CSMs for each VI Study building. The building survey included collection of data related to indoor air quality such as use or storage of cleaning products, paints, and/or petroleum hydrocarbon products, aerosol consumer products, smoking, etc.

Before sampling, the buildings will be resurveyed to determine if conditions have changed since the building surveys. Undifferentiated VOC concentrations will be measured using a ppbRAE®, or equivalent, and recorded during the building resurveys to identify potential indoor air sources or the general location of potential indoor air sources. Where possible and reasonable, the indoor air sources will be removed or containerized from the buildings prior to proficiency air sampling. The Building Physical Survey Questionnaire (Form 1) will be updated as necessary for each building. The completed Building Physical Survey Questionnaires for the buildings requiring mitigation are provided in Appendix E. The Building Physical Survey Questionnaire Form 1 is provided in Appendix H1.

Typically, the intake point of the indoor air sample canisters will be located at the breathing zone height, between approximately 3 to 5 feet (1 to 1.5 meters) above floor level, in the lowest level of the property (i.e., basement or first floor for slab on grade buildings). Valley will situate the indoor air sample canister as close as practical to the location of the original indoor air samples collected during the 2012 Vapor Intrusion Investigation. Valley will endeavor to situate the canisters in areas that are not subject to disturbances or locations that interfere with the occupants' operational activities which may lead to a false indication of an indoor air issue. Valley will collect indoor air samples at the actual or contingency indoor air locations specified in the figures for buildings with installed active SSDSs (Figures 3.2 through 3.9).

When indoor air samples are collected, Valley will also collect an outdoor air sample in the vicinity of the structure as per Valley 's SOP. Where samples are collected from adjacent or nearby buildings, one outdoor air sample may be sufficient for comparison to the indoor air sample results from more than one building.

Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Dayton, Ohio during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center website.

3.4 <u>SUB-SLAB SOIL VAPOR PROBE SAMPLING</u>

Sub-slab soil vapor probe installation and sampling, if required, will be performed in accordance with the SOP. All buildings to be mitigated have an area less than 1,500 square feet; only one sub-slab port exists and will be tested.

Valley will complete leak testing prior to sub-slab soil vapor probe sample collection by injecting helium into a shroud covering the sub-slab probe, and monitoring for the presence of helium in the purged sub-slab soil vapor using a field meter.

Valley will purge stagnant air from the sub-slab soil vapor probes into Tedlar bags using a lung box sampler and pump. Valley will purge one to two liters of sub-slab soil vapor from the probe assembly, into a Tedlar bag. One liter of sub-slab soil vapor will be greater than three volumes from the sub-slab soil vapor probe assembly (probe and attached Teflon® tubing). This ensures that the sub-slab soil vapor sample is representative of actual vapor concentrations within the sub-slab bedding material.

Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Dayton, Ohio during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center website.

3.4.1 SUB-SLAB SOIL VAPOR PROBE SAMPLING FOR METHANE

Following purging and leak checking of the sub-slab soil vapor probe, Valley will collect a second Tedlar bag sample of sub-slab soil vapor to measure post-purge/pre-sample values of methane, lower explosive limit (LEL), oxygen, and carbon dioxide, using appropriate meters. The Tedlar bag will be field screened and emptied outside the building to avoid releasing contaminants within the building.

The required sub-slab soil vapor samples will then be collected into SUMMA Canisters. Following sample collection, Valley will collect sub-slab soil vapor from the probes into Tedlar bags with a lung box sampler and pump in order to measure post-sample methane, carbon dioxide, and oxygen values.

The following information from the USEPA (2005) Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities will be considered when selecting times for measuring methane levels: "Highest methane concentrations occur in the warmer summer months, and concentrations are higher during the heat of the day compared to measurements taken during morning hours. Landfill gas levels in soils tend to be higher during dry periods and lower after significant rainfall events."

Total VOCs in sub-slab soil vapor will be measured with a photoionization detector (PID) each time the methane, carbon dioxide, and oxygen concentrations are measured at each probe.

Valley will measure the levels of methane, carbon dioxide and oxygen using a portable combustible gas meter, specifically LandTec GEM 2000, or equivalent. Valley will measure filtered and unfiltered combustible gases with the LandTec GEM 2000. The LandTec GEM 2000 filtered measurements will be collected using a charcoal carbon filter. LandTec GEM 2000 reports the concentration of methane in units of percentage of the LEL of methane (i.e., 0 to 100 percent of LEL). The LandTec GEM 2000 measures the concentrations of oxygen, carbon dioxide, and carbon monoxide. The greatest values obtained during sampling will be recorded.

To confirm detections of methane using field instruments, separate sub-slab soil vapor or indoor air samples collected in SUMMA canisters will be submitted for analysis of fixed gases (methane, ethane, and ethene) by ASTM Method D1946. The confirmatory samples will be used to verify the detected methane readings measured with the field meters. If methane concentrations in indoor air are measured with the field meter above 25 percent of the lower explosive limit (i.e., 1.25% methane), an immediate or rapid response will be necessary to eliminate the explosive hazard and confirmatory laboratory samples aren't necessary.

3.5 QUALITY ASSURANCE / QUALITY CONTROL SAMPLES

Field duplicate samples will be collected at a frequency of 10 percent per sample media for VOC analysis. The sample media are (1) sub-slab soil vapor and (2) indoor air and outdoor air. Duplicate samples will be collected in the same manner and from the same location as the normal samples are collected. A stainless-steel T-connector will be used to connect two SUMMA canisters together so the parent and duplicate sample are collected concurrently from the same intake.

Quality assurance (QA)/quality control (QC) for the methane field screening results will be accomplished by: 1) measuring methane twice, at least 8 hours apart, at each sub-slab soil vapor and indoor air sample location; 2) submitting 20 percent of the sub-slab soil vapor SUMMA canisters and 20 percent of the indoor air SUMMA canisters for laboratory analysis of methane by ASTM Method D1946.

USEPA reserves the right to collect split sub-slab or side-by-side indoor air for any sample collected at the Site. The split samples will be collected in the same manner as duplicate samples.

3.6 <u>SAMPLE ANALYSIS</u>

The sub-slab, indoor air and outdoor air samples for VOC analysis will be collected in 6-liter SUMMA canisters equipped with flow controllers set to collect the samples over an 8-hour period for industrial and commercial buildings.

The SSDS effluent grab samples for VOC analysis will be collected in 1-liter SUMMA canisters. Grab samples will be collected directly from the SSDS effluent sample ports of the building with the greatest sub-slab TCE concentration (based on the most recent sample results available at the time), for the duration of system operation. At each sampling port location, the male plug will be removed and silicon tubing will be attached to the sampling port and replaced with a male fitting with silicon tubing. The fitting will be attached from the SSDS regulator to the tubing attached to the sample port. The 1-liter SUMMA canister will be attached to the regulator. The sample port will be closed when the vacuum reading is between -10 to -1 "Hg. The grab sampler will be removed from the SUMMA canister; the fitting/tubing will be removed from the sample port and regulator. The male plug will be resecured to the sample port.

Valley will submit SUMMA canister samples under chain of custody protocols to the laboratory for VOC analysis in accordance with USEPA TO-15. The full TO-15 list will be reported for each sample, unless USEPA approves for a TO-15 subset prior to the sampling activity. If required, to confirm detected methane field readings, samples collected in SUMMA canisters will be submitted for analysis of fixed gases (methane, ethane, ethene) by ASTM Method D1946.

3.7 CLEANUP CRITERIA

Valley will evaluate analytical results against ODH indoor air and sub-slab soil gas screening levels for non-residential locations. ODH screening levels for naphthalene were provided by electronic mail (email) on September 13, 2012. Revised ODH screening levels to correct the indoor air non-residential values for o-xylene were issued on October 9, 2012.

Valley will design and install a vapor mitigation system in non-residential (commercial) structures impacted by subsurface gas migration, if the concentration(s) of COCs are greater than ODH sub-slab or indoor air screening levels and the presence of the COC is determined to be a result of vapor intrusion.

4.0 MITIGATION PLAN

One of the primary objectives of the VI Mitigation Activity is to design and install a vapor mitigation system in on-Site non-residential (i.e., commercial) structures impacted by subsurface gas mitigation, if the concentration(s) of COC(s) exceed ODH sub-slab or indoor air screening levels and the presence of the COC(s) is determined to be a result of vapor intrusion. Section 4.6 presents a summary of all buildings sampled during the VI Investigation and the associated mitigation decisions. The "Mitigation Summary Database" Excel file used to track the progress of mitigation is a living document, and the version current as of the date of Work Plan, is included as Appendix F. This document will be updated as needed throughout the VI Mitigation Activity in order to reflect the status of the mitigation and any new information received.

Valley proposes to demolish Building 1, the brick front office space associated with Building 2, Building 7 and the MP Building. Therefore, Valley will focus mitigation activities on the back (storage) area of Building 2 and on Buildings 4 and 5. Currently, mitigation activities are not planned for Building 6; sub-slab monitoring will determine the appropriate course of future action.

Beginning on May 2, 2013, USEPA, USEPA START contractor, Valley and Bowser Morner will participate in weekly update conference calls regarding the Mitigation Summary Database and next steps. Appendix G presents the meeting agenda and meeting minute templates for the weekly conference calls.

The abatement system will include installation of a SSDS, sealing cracks in walls and floors of the basement or lowest building floor, and sealing drains that could be a pathway. Structures with sub-slab methane concentrations greater than 0.5 percent by volume will require an intrinsically safe SSDS. Active SSDSs will be designed and installed in the specified buildings to reduce potential indoor air inhalation issues. This is achieved by creating a lower air pressure beneath the floor slab than above the floor slab. Valley will work closely with an ODH Licensed Radon Contactor who will be responsible for ensuring proper installation and operation of the systems. The scope of the work for the SSDSs will include:

Task 1 – Conduct a building inspection / engineering evaluation.

Task 2 – Design SSDS and submit designs USEPA for approval.

Task 3 – Install SSDS

Task 4 – Develop a Mitigation Proficiency Sampling Plan

Task 5 – Perform Proficiency Sampling and Annual Inspections/Maintenance.

4.1 TASK 1 – CONDUCT BUILDING INSPECTION AND ENGINEERING EVALUATIONS

Valley will review and confirm building plans and blueprints, if available, and conduct pre-design building inspections. This will include evaluation of the building layouts and construction components including HVAC, electrical and structural. Of particular interest are the building foundations, sub-slab layouts and orientations including materials of construction, utility connections and conduit layouts for future design purposes. Sealing of cracks may be completed at this stage, if appropriate.

4.2 TASK 2 – DESIGN SUB-SLAB DEPRESSURIZATION SYSTEM

The information obtained from the Building Physical Survey and sub-slab probe installation(s) will be used to prepare conceptual layout design drawings. The system design will include the number and location of suction points, pipe routing, discharge point(s), fan location(s), and fan sizing. The basic design requirements will be prepared to a level acceptable for use for contractor bidding purposes. One or more contractors will participate in inspections of the buildings or, at the contractor's discretion, will agree to rely on inspections of the buildings completed by others. Following the building inspections, the contractor will prepare a Design Plan, which, after it is approved by Valley and Bowser Morner, will be submitted USEPA. The designs will be based on SDDL-specific instruction provided by USEPA, industry standards, local code, and manufacturer information regarding equipment performance for an active depressurization system. In this case, for buildings with areas less than 1,500 square feet, one SSDS will be installed. For buildings with areas greater than 1,500 square feet, one or more SSDSs and/or suction pipes will be installed. The number of SSDS and/or suction pipes will be dependant upon the building configuration and locations will be chosen to minimize disruption to business operations.

Following receipt of USEPA approval, the contractors will proceed with the installation.

Following completion of the installation, a Mitigation System As-built Report will be submitted to USEPA. This Mitigation System As-built Report will be included in the operation, maintenance & monitoring (OM&M) manual. These reports will contain the following information:

- Data from the vacuum-radius of influence testing, including sub-slab vacuum and flow measurements
- Figure(s) showing the number of extraction locations and performance monitoring points
- Figure(s) showing the route of the discharge piping system(s) and the location of the exhaust fan(s) for each building

- Identification of materials and equipment used for each system (piping, blower, sizing, vacuum monitoring, valving, etc.)

- Procedures for startup and performance testing following system installation.

- Operational goals and objectives including radius of influence and vacuum field monitoring point vacuums

An intrinsically safe system will be installed at properties which have methane beneath the sub-slab greater than 0.5 percent by volume.

A visual inspection will be completed to verify that no air intakes have been located near the proposed exhaust discharge point(s).

Following receipt of approval of the mitigation system design by USEPA, Valley will solicit contractor proposals, and undertake contractor procurement. As noted above, the contractor will be a licensed ODH Licensed Radon Contractor. In the event that a design-build approach is adopted, Valley will solicit contractor proposals prior to commencing the design and will commence installation of the SSDS following receipt of approval from USEPA.

4.3 TASK 3 – INSTALL THE SSDS

The SSDS in each building may consist of multiple vapor recovery points based on square footage and radius of influence testing. Either fan(s) or larger blower(s) connected to extraction point(s) will be installed outside the building, mounted directly on the system piping and fastened to a supporting structure by means of mounting brackets. The fan(s) or blower (s) will operate continuously to pull a vacuum from the vapor recovery point(s). The vapors will discharge to the outdoor air above the building roof. This will allow any VOCs present to dissipate more readily. As methane is lighter than air, discharging the gases above the roof top ensures that any methane that may be present will not create a localized explosion hazard near the ground surface where potential ignition sources could ignite it. A sample port and an air-velocity monitoring access point will be installed in the discharge pipe at least two feet away from any constrictions (i.e., bends, elbows, etc.) and after (i.e., above) the fan. A common external fuse panel will be considered to power the SSDS system(s). All exterior electrical panels must be weatherproof, must provide an uninterruptable power source, and be secured with a lock and tamper-proof box. Equipment used to install the SSDS beneath buildings where explosive gases are present in the sub-slab vapor at concentrations greater than 10 percent of the LEL or where no sub-slab explosive gas data are available will be intrinsically safe, because of potential explosive hazards.

Permanent vacuum monitoring points will be installed for each system, on the suction side of the fan. A permanent vacuum gauge will consist of a “U-tube” manometer, or similar device, with a minimum vacuum of 1 inch of water. The permanent vacuum monitoring points will document that the sub-slab beneath the entire building has been depressurized. Valley will verify that manometer vacuum is in the range of 1 or 4 inches of water ("w.c.”), and will mark the operating vacuum on the manometer. The vacuum will be set to the minimum required to depressurize the entire slab and is expected to be in the range of 1 or 2" w.c. The number of vacuum monitoring points will be determined during the design process.

Following the installation of the SSDSs, the radius of influence of each system will be checked using a digital manometer to determine if a vacuum is applied across the entire building slab. The digital manometer can be used at the sub-slab soil vapor probe locations, provided that they are located on opposite sides of the slab from the suction point. Additional sub-slab depressurization points and monitoring points can be installed if the resulting vacuum proves insufficient or more monitoring points are required.

USEPA 2008 guidance document titled “Indoor Air Vapor Intrusion Mitigation Approaches” states that the generally accepted target range for depressurization is 4 to 10 pascals or 0.0161 to 0.04" w.c., with a nominal continuous operating range of depressurization from 0.025 to 0.035" w.c. for standard permeability sub-slab material. However, differential pressure ranges as low as 0.001" w.c. are sufficient to effectively depressurize a sub-slab, according to USEPA 1993 guidance “Radon Reduction Techniques for Existing Detached Houses: Technical Guidance for Active Soil Depressurization Systems.

If the digital manometer shows a vacuum reading of negative 0.004" w.c. below the slab, then there are sufficient indications that the active system is successfully depressurizing the sub-slab area across the footprint of the building. During the operation and monitoring of the SSDSs, Valley will compare the vacuum measurements to the appropriate ranges, and if necessary, make adjustments to the SSDSs.

The following information will be recorded to define the operating performance of the SSDSs:

- Location of the sub-slab sample points
- Initial sub-slab pressure field measurements
- Static pressure at each permanent vacuum monitoring point (U-tube manometer readings)
- Static pressure at the fan inlet
- Photos of the SSDS header and fan

Valley periodically will check the system components following completion of system installations. If Valley notices damage to the SSDS or the system is not functioning within the range marked on the permanent vacuum monitoring points, they will call a Bowser Morner contact. Labels on the system components will list a telephone number for a Bowser Morner contact.

Any gaps around the extraction point penetration and utility penetrations through the foundation floor will be appropriately sealed. Other opening and cracks in the foundation will be sealed where necessary and feasible.

As specified in Section 3.2.1.3 above, Valley will collect an effluent air sample from the extraction pipe of the building with the greatest sub-slab TCE concentration on an annual basis. The effluent air sample results will be compared to State of Ohio de minimis levels, documented in OAC 3745-15-05, to determine if off-gas treatment is required.

4.4 TASK 4 – DEVELOP A MITIGATION PROFICIENCY SAMPLING PLAN

A Mitigation Performance Sampling Plan will be developed and will include provisions for monitoring the SSDSs immediately after system start-up to document that the sub-slab beneath each mitigated building has been depressurized, as well as to document continuous and long-term reduction of indoor air concentrations of VI contaminants to less than applicable criteria.

4.5 TASK 5 - PERFORM PROFICIENCY SAMPLING AND ANNUAL INSPECTIONS/MAINTENANCE

4.5.1 MONITORING PROGRAM

Valley will complete system startup monitoring to document that the sub-slab beneath the entire area of concern in each building has been depressurized. The system startup monitoring will consist of monitoring and recording the vacuum at each of the vacuum monitoring points in each building using a digital manometer immediately following start-up.

To verify that the mitigation systems are operating to reduce sub-slab concentrations of VI contaminants beneath the slabs of intact buildings to less than applicable criteria, Valley will complete post-installation proficiency sub-slab air sampling as discussed in Section 3.2.1.4. Valley will collect sub-slab samples from all locations with an installed vapor abatement mitigation system 30-days, 180-days and annually following system installation, provided the SSDS is still required. Valley will also complete radius of influence testing as the same time as the sub-slab sampling. If ODH screening levels are exceeded, Valley will submit a Corrective Action Plan to USEPA within 30 days. Proficiency air sampling will continue until USEPA notifies Valley that work is complete. Valley will provide the results and corresponding evaluation after each sampling event to USEPA within 30 days of receiving the complete set of final analytical data.

To further verify that the mitigation systems are operating to reduce indoor air concentrations of VI contaminants to less than applicable criteria, Valley will complete post-installation proficiency air sampling as discussed in Section 3.21.1. Valley will collect indoor air samples from all locations with an installed vapor abatement mitigation system 30-days, 180-days, and 1 year, following system installation. Valley will also complete radius of influence testing at the same time as the indoor air sampling. If ODH screening levels are exceeded, Valley will submit a Corrective Action Plan to USEPA within 30 calendar days of discovery.

Valley will also complete annual indoor air sampling at one building per year, beginning the second year after system installation, provided the SSDS is still required. Proficiency air sampling will continue until USEPA notifies Valley that work is complete. Valley will provide the results and corresponding evaluation after each sampling event to USEPA within 30 calendar days of receiving the complete set of final analytical data.

4.5.2 MAINTENANCE OF THE SSDS

An OM&M plan will be completed within 60-days of system start-up. The OM&M plan will detail activities required to operate the SSDS, perform repairs, and a guideline to evaluate the effectiveness of system operations. The contents of the OM&M manual will include, but not be limited to:

- Operator's manual for the system
- Contact information sheet
- System life expectancy
- Fan warranty information
- Baseline sample results (30- and 180-days and Annual sampling rounds)
- Proficiency sample results
- Annual inspection log sheets
- Photographic documentation
- Mitigation Acceptance Letter

- Mitigation System As-built Report (including map of system)
- Key to the padlock to turn the system “on” and “off”

The general OM&M plan will include an appendix containing any system-specific information required for each building. The OM&M plan will be placed in a binder to allow for easy updating of any required information and kept on-site.

The SSDS maintenance program will include an inspection and repair program for the system components. Valley will conduct a semi-annual inspection of the SSDS in the first year of operation, and annually thereafter, to ensure proper functionality. The inspection program will include visual inspections of the SSDSs for deficiencies to verify that the system components are effectively performing their intended functions. The following forms, provided in Appendix H, will be included in the OM&M Plans:

- Building Physical Survey Questionnaire
- SSDS Inspection checklist
- Repair Log

4.5.3 ANNUAL SSDS INSPECTIONS

Valley will complete annual performance inspections on all SSDS installed to ensure that they are functioning properly. System performance inspection activities will include, but are not limited to:

- System vacuum / pressure readings will be checked to ensure the system is operating in the design range
- Sub-slab pressure field readings will be measured at permanent sub-slab sample points to ensure sub-slab depressurization is negative (for buildings with active SSDS and slab foundations)
- Visual inspection of system piping and components for damage
- Inspection of floor and wall seals, and seals around system piping penetrations, including checks for any additional areas requiring sealing
- Confirm operation of the blower fan, including checks for unusual noise or vibration

- Confirm padlock is attached to the on / off switch
- Confirm operation with on-site employees and inspection to determine if there have been any spills, releases, and/or operational changes that may influence the need for system operation

A copy of the Annual SSDS Inspection Form is included in Attachment H.

4.6 VI INVESTIGATION BUILDING MITIGATION SUMMARY

In 2012, others completed vapor intrusion investigations of buildings on Valley Asphalt's Property (1901 and 1903 Dryden Road, Parcel 5054). The seven buildings that were investigated are shown on Figure 1.2. In accordance with the Mitigation Summary Database Excel file, current as of the date of this report, of the seven buildings investigated:

- Four structures* are proposed for demolition, pending a final decision by Valley.
- Three structures* will require a SSDS.
- One building must be assessed for sub-slab contaminants; a removal decision will be made after the assessment results are received.

(* Note that one building, Building 2, consists of two structures: an office space [located in the front of Building 2] and a storage space [located at the back of the building].)

5.0 SYSTEM DECOMMISSIONING / PROJECT CLOSE-OUT ACTIVITIES

- Criteria to determine when it is appropriate to cease operation of individual vapor SSDSs will be submitted at a future date for US EPA approval.

5.1 ABANDONMENT OF GAS MONITORING PROBES

In the event that a sub-slab soil vapor probe becomes damaged, plugged, or otherwise rendered unusable, or alternatively at the completion of all explosive gas monitoring requirements, the respective gas probe(s) will be abandoned in accordance with industry standards. Such abandonment will consist of over-drilling the sub-slab probe(s) and filling it with cement. No gas monitoring probes will be abandoned without prior authorization from USEPA. If a damaged, plugged, or otherwise unusable probe is still required for monitoring sub-slab soil vapor conditions at a particular location, Valley will replace the probe following the procedures documented in Section 3.4 and Appendix J.

6.0 PROJECT MANAGEMENT

6.1 RESPONSIBILITIES AND FUNCTIONS

The companies, individuals and associated contact numbers for those who will be responsible for the various aspects of the work are detailed in the organizational chart below:

Contact Name	***Phone No.***
Steven Renninger (U.S. EPA OSC)	513-260-7849
Leslie Patterson (U.S. EPA RPM)	312-886-4904
Laura Marshall (Ohio EPA)	937-285-6452
John Sherrard (Dynamac Corporation, USEPA START contractor)	513-703-3092
Mark Case (Pubic Health – Dayton / Montgomery County)	937-225-4429
Bob Frey (ODH)	614-466-1069
Katherine Beach (Project Coordinator, Bowser Morner)	937-236-8805, ext. 340 937-308-1694 (cell)
Jeff Arp (Bowser Morner)	937-236-8805, ext. 258 614-419-0414 (cell)

7.0 PROJECT SCHEDULE

Task	*Schedule*
Weekly Mitigation Status update conference calls with USEPA and Respondents	Thursdays at 3:00 pm
Work Plan Due Date	10 days from the AOC Effective Date AOC Effective Date is April 16, 2013 Due Date is April 26, 2013
Revised Work Plan Due Date	May 15, 2013
Written notification to USEPA of new contractors and/or subcontractors	At least 5 days prior to commencement of Work
Conduct Asbestos and Lead field surveys	May 15, 2013
Demolish the front (north) portion of Building 2, and Buildings 1, 7 and MP.	July 31, 2013
Initiate Section 4.0 tasks	Within 5 working days of Work Plan approval
Conduct building inspections / engineering evaluations	Anticipated date: week of May 20, 2013
Obtain quotes from licensed radon mitigation companies	Within 1 week of completion of building inspection
Select licensed radon mitigation company	Within 1 week of receipt of quotes
Design sub-slab depressurization system	Within 3 weeks of completion of building inspection / engineering evaluation and Ohio licensed radon subcontractor procurement
Install SS probe in Building 6	Within 4 weeks of completion of design of sub-slab depressurization system
Install SSDS (including additional SS probes, if indicated)	Within 4 weeks of completion of design of sub-slab depressurization system
Implement Mitigation Proficiency Sampling Plan	Within 30-days of installation of sub-slab depressurization system
Monthly Progress Reports	30 days after approval of Work Plan, until termination of ASAOC
Oral notification of any delay in performance of UAO Obligations	Within 24 hours
Written notification of any delay in performance of UAO obligations	Within 7 days thereafter
O&M Manual submission to USEPA	Within 60 days of SSDS start-up
Annual SSDS Inspections	Complete within 30 days of determination of schedule (annually thereafter)
Proficiency indoor air sampling (new SSDS installations)	30, 180, and 365 days post-installation
Proficiency air sampling (sub-set of systems)	Beginning 2 years following SSDS

Task	*Schedule*
	installation
Submission of Corrective Action Plan	Within 30 days of receiving indoor air sampling results that are greater than ODH screening levels
SSDS Upgrades	Within 30 days of receiving validated proficiency air sampling analytical results
Indoor air proficiency sample following completion of SSDS Upgrades (if required)	Within 30 days of completion of system modifications
Provision of analytical results and corresponding evaluation to USEPA following each sampling event	Within 30 days of receiving the complete set of final analytical results
Final Report summarizing actions completed to comply with UAO	Within 60 days of completion of all work specified in Section V of the UAO (i.e., following completion of proficiency indoor air sampling for new SSDS installations)

APPENDIX A

UNILATERAL ADMINISTRATIVE ORDER

APPENDIX B

METHANE MONITORING FORM

APPENDIX C

HEALTH AND SAFETY PLAN

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

APPENDIX E

COMPLETED BUILDING PHYSICAL SURVEYS FOR BUILDINGS REQUIRING MITIGATION

APPENDIX F

MITIGATION SUMMARY DATABASE

APPENDIX G

USEPA/VALLEY MEETING AGENDAS AND MINUTES

APPENDIX H

OM&M PLAN FORMS
ATTACHMENT 1 – BUILDING PHYSICAL SURVEY QUESTIONNAIRE
ATTACHMENT 2 – INSPECTION CHECKLIST
ATTACHMENT 3 – REPAIR LOG

APPENDIX I

QUALITY MANAGEMENT PLAN

APPENDIX J

USEPA RESPONSE ENGINEERING AND ANALYTICAL CONTRACT (REAC) SOP# 2082

ATTACHMENT 1

BUILDING PHYSICAL SURVEY QUESTIONNAIRE

ATTACHMENT 2

INSPECTION CHECKLIST

ATTACHMENT 3

REPAIR LOG

FIGURES